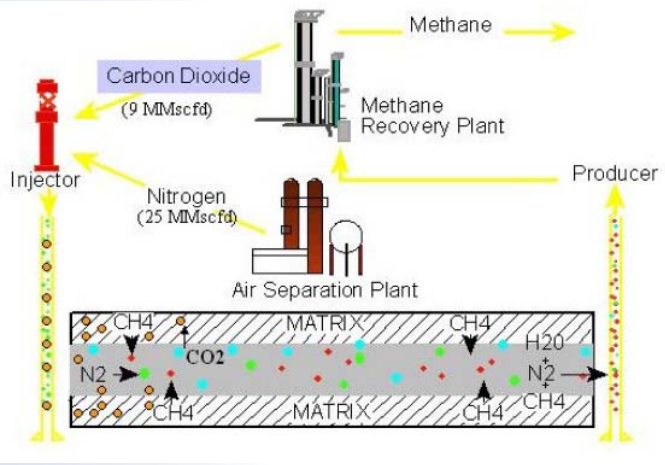
CO_2 Sequestration with Enhanced Coal Bed Methane Recovery

Positioning for a sustained long-term research effort and aiming at solving real world carbon sequestration problems, INL is actively engaged in developing a regional sequestration partnership that includes other research institutions, state government agencies and industry partners.

About the Research

There is a growing concern in the international community that CO_2 emissions from burning fossil fuels may play an important role in global climate change. Recent efforts in reducing the carbon content in fuels and improving the energy efficiency can certainly help in reducing the amount of CO_2 released into the atmosphere. However, large-scale carbon sequestration will definitely be required to achieve the U.S. national goal of reducing green house gas emissions from 1530 million tons of carbon equivalent (tce) in 2002 to 1255 million tce in 2012.

The first large-scale opportunities for carbon dioxide sequestration are likely to be associated with storage in geologic formations. These geologic formations include oil and natural gas reservoirs, saline aquifers, and coal beds. In some instances, the recovery of a saleable commodity will offset the cost of sequestration. Naturally, these projects will be favored over non-income generating projects. Included within this category are CO_2 injection for enhanced oil recovery, ressure maintenance of oil or gas reservoirs, and enhanced methane production from coal seams. Of the sequestration options available, geologic sequestration of CO_2 in coal formations to enhance coal bed methane production is considered one of the methods with the greatest short-term potential.



CO_2 sequestration with enhanced coal bed methane recovery at BP's Tiffany Field.

Current Research

Current research activities at the INL focus on addressing the knowledge gaps as well as the risks involved in geologic sequestration of CO_2 in coal seams. The actual CO_2 sequestration capacity of coal is largely dictated by how effectively injected gases contact and interact with the reservoir over the active project lifetime — defined as the economic limit for methane recovery and CO_2 storage. Usually this is dictated by CO_2 breakthrough, poor injectivity or a variety of other factors that make further operation economically prohibitive.

Obvious factors, which may control contact and interac-

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Science

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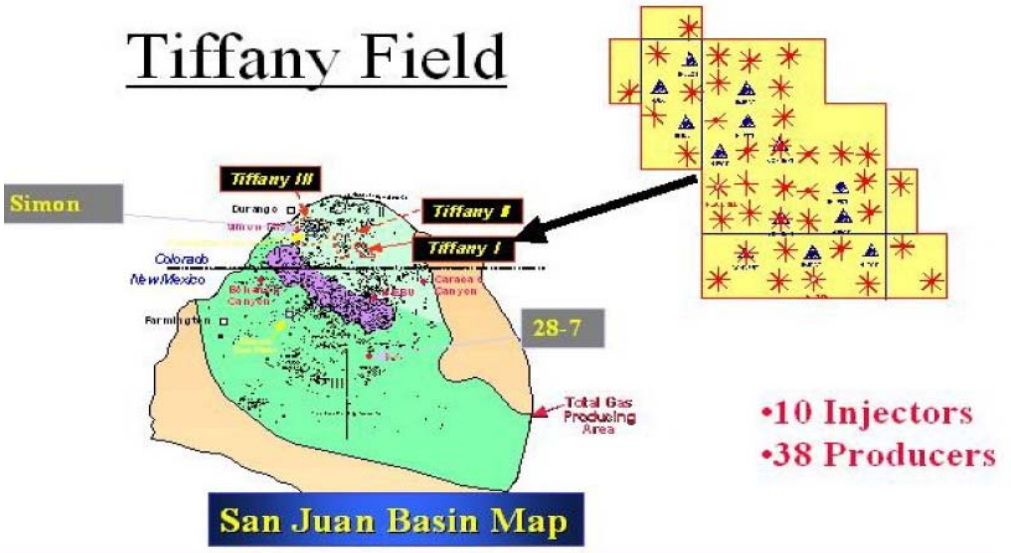
tion, include the CO_2-coal capacity curve (isotherm), reservoir heterogeneity, the respective roles of convective and diffusive transport in a fractured medium, and the effect of CO_2 on reservoir permeability. Unfortunately, the effects of these factors are still not well understood. To address these knowledge gaps, INL has two ongoing projects studying the effect of CO_2 on reservoir permeability and the multi-component CO_2 adsorption behavior of coal.

Also, through a collaborative agreement with BP, INL developed mechanistic models specific to CO_2 sequestration in BP's Tiffany coal bed methane (CBM) field. These models are necessary to estimate storage capacity, in-situ concentration, transport velocity, contacted volume, and the timeframe for filling, monitoring, and storage. In a separate project funded by a joint industry consortium, the Carbon Capture Project (CCP), INL is in the process of developing methodology for conducting probabilistic risk assessment of CO_2 storage in coal using the Tiffany field as the actual field demonstration of the technology. The mechanistic models developed in BP's Tiffany project are being used as predictive models in the risk analysis project.



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